



Hybrid Laser/GMA Pipe Welding System

A new welding process, sponsored by the Navy ManTech (manufacturing technology) program, combines

- the ease of use and weld strength of gas metal arc (GMA) welding;
- the precision, speed, and penetration of laser welding; and
- the speed and uniformity of robotic automation.

A prototype system currently being tested and evaluated at a shipyard in San Diego is welding pipe joints with record speed.



A typical ship, such as the 689-foot long T-AKE class Combat Logistics Force Underway Replenishment vessel, has several miles of pipe with thousands of welded joints. Welding thick or large parts can require several passes, a process that consumes time and energy and can introduce flaws.

Laser welders can penetrate deeply into a joint between two metal parts, with less heat input, but they are less forgiving than traditional welding processes. Arc welders make a larger weld puddle, requiring less stringent tolerances for fitting parts together by spreading molten metal into the gap between parts. By combining the best features of both types of welding, sound welds can be produced with much less time and heat input than with conventional methods. The new hybrid system is economical and energy efficient because of the reduced number of welding passes required, and the welding process is much faster because of automated controls and the deeper penetration of the laser beam.

Pennsylvania State University's Applied Research Laboratory has developed the weld parameters, working through Navy ManTech's Center for Naval Shipbuilding Technology. General Dynamics has installed a prototype system at their NASSCO (National Steel Shipbuilding Company) shipyard in San Diego.

As of April 2007, the hybrid welding system is going through the approvals process from the American Bureau of Shipping (ABS) and the Naval Sea Systems Command.

Specifications:

Speed: ~7 min/piece (1–1.5 hrs arc welding)
Welding passes required: 1 (6–8 arc welding)

7 kW ytterbium fiber laser (IPG Photonics)
Robotic controls (Wolf Robotics)

